



UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
Washington, DC 20460

AUTHENTICATION

I, John Steenbock, attest that I am the Director, Office of Resource Management, Office of Research and Development of the United States Environmental Protection Agency (EPA or Agency) and that the attached document is true, correct, and compared copies of the file copies in my legal custody, consisting of:

9. IRIS Additional Information (Last Updated – May 15, 2019).pdf

<https://cfpub.epa.gov/ncea/risk/recordisplay.cfm?deid=2776> (1 page)

8. IRIS Glossary (Last Updated – June 22, 2022).pdf

<https://www.epa.gov/iris/iris-glossary> (37 pages)

Subscribed under the penalty of perjury on this 13th day of July, 2023.

John Steenbock, Director
Office of Resource Management
Office of Research and Development

CERTIFICATION OF TRUE COPY

I, Jennifer Clark, certify that I am the Associate General Counsel, General Law Office, Office of General Counsel, of the United States Environmental Protection Agency; that I am the designee of the General Counsel for the purpose of executing certifications under 40 C.F.R. sec. 2.406; that I have duties in Washington, District of Columbia; and that the official whose signature appears above has legal custody pursuant to 40 C.F.R. sec. 2.406 of the original documents, copies of which are attached, as witnessed by my signature and the official seal of the United States Environmental Protection Agency.

Jennifer Clark
Associate General Counsel
General Law Office
Office of General Counsel



Integrated Risk Information System (IRIS)

Overview

History

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Additional Information

In general IRIS values cannot be validly used to accurately predict the incidence of human disease or the type of effects that chemical exposures have on humans. This is due to the numerous uncertainties involved in risk assessment, including those associated with extrapolations from animal data to humans and from high experimental doses to lower environmental exposures. The organs affected and the type of adverse effect resulting from chemical exposure may differ between study animals and humans. In addition, many factors besides exposure to a chemical influence the occurrence and extent of human disease.

Any alteration to an RfD, RfC, slope factor or unit risk as they appear in IRIS (for example, the use of more or fewer uncertainty factors than were applied to arrive at an RfD) invalidates and distorts their application in estimating the potential health risk posed by chemical exposure.

Each reference dose/concentration and carcinogenicity assessment has been reviewed by a group of EPA health scientists using consistent chemical hazard identification and dose-response assessment methods. These methods are discussed or referenced in the Background Documents. It is important to note that the information in IRIS may be revised by EPA, as appropriate, when additional health effects data become available and new developments in assessment methods are adopted.

LAST UPDATED ON MAY 15, 2019

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IRIS Glossary

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This glossary contains definitions of terms used frequently in IRIS Program assessments and related materials. These definitions assumed that the user has some familiarity with risk assessment and health science.

A B C D E F G H I J K L M N O P Q R S T U V W X Y Z

A

Acceptable Daily Intake (ADI): The amount of a chemical a person can be exposed to on a daily basis over an extended period of time (usually a lifetime) without suffering deleterious effects.

Acute Exposure: Exposure by the oral, dermal, or inhalation route for 24 hours or less.

Acute Reference Concentration (RfC): An estimate (with uncertainty spanning perhaps an order of magnitude) of a continuous inhalation exposure for an acute duration (24 hours or less) to the human population (including sensitive subgroups) that is likely to be without an appreciable risk of deleterious effects during a lifetime.

It can be derived from a NOAEL, LOAEL, or benchmark concentration, with uncertainty factors generally applied to reflect limitations of the data used. Generally used in EPA's noncancer health assessments.

Acute Reference Dose (RfD): An estimate (with uncertainty spanning perhaps an order of magnitude) of a daily oral exposure for an acute duration (24 hours or less) to the human population (including sensitive subgroups) that is likely to be without an appreciable risk of deleterious effects during a lifetime. It can be derived from a NOAEL, LOAEL, or benchmark dose, with uncertainty factors generally applied to reflect limitations of the data used. Generally used in EPA's noncancer health assessments.

Acute Toxicity: Any poisonous effect produced within a short period of time following an exposure, usually 24 to 96 hours.

Additional Risk (Added, Attributable Risk or Risk Difference) (AR): The calculated difference in risk of a particular condition between those who are exposed and those who are not. This measure is derived by subtracting the rate (usually incidence or mortality) of the disease among the unexposed persons (P_u) from the corresponding rate among the exposed (P_e), i.e., $AR = P_e - P_u$. The AR is an absolute measure of the excess risk attributed to exposure.

Adverse Effect: A biochemical change, functional impairment, or pathologic lesion that affects the performance of the whole organism, or reduces an organism's ability to respond to an additional environmental challenge.

Aerodynamic Diameter: The diameter of a sphere with unit density that has aerodynamic behavior identical to that of the particle in question; an expression of aerodynamic behavior of an irregularly shaped particle in terms of the diameter of an idealized particle. Particles having the same aerodynamic diameter may have different dimensions and shapes.

Aerosol: A suspension of liquid or solid particles in air.

Anecdotal Data: Data based on the description of individual cases rather than controlled studies.

Average Daily Dose (ADD): Dose rate averaged over a pathway-specific period of exposure expressed as a daily dose on a per-unit-body-weight basis. The ADD is usually expressed in terms of mg/kg-day or other mass-time units.

B

Background Levels: Two types of background levels may exist for chemical substances: (a) Naturally occurring levels: Ambient concentrations of substances present in the environment, without human influence; (b) Anthropogenic levels: Concentrations of substances present in the environment due to human-made, non-site sources (e.g., automobiles, industries).

Benchmark Dose (BMD) or Concentration (BMC): A dose or concentration that produces a predetermined change in response rate of an adverse effect (called the benchmark response or BMR) compared to background.

BMDL or BMCL: A statistical lower confidence limit on the dose or concentration at the BMD or BMC, respectively.

Benchmark Response (BMR): An adverse effect, used to define a benchmark dose from which an RfD (or RfC) can be developed. The change in response rate over background of the BMR is usually in the range of 5-10%, which is the limit of responses typically observed in well-conducted animal experiments.

Benign Tumor: A tumor that does not spread to a secondary localization, but may impair normal biological function through obstruction or may progress to malignancy later.

Bioassay: An assay for determining the potency (or concentration) of a substance that causes a biological change in experimental animals.

Bioavailability: The degree to which a substance becomes available to the target tissue after administration or exposure.

Biologically Based Dose Response (BBDR) model: A predictive model that describes biological processes at the cellular and molecular level linking the target organ dose to the adverse effect.

Blood-to-air Partition Coefficient: A ratio of a chemical's concentration between blood and air when at equilibrium.

C

CAS Registry Number: The Chemical Abstract Service Registry Number (CASRN) is a unique numeric identifier, designed to designate only one substance so it can be referenced by many Government Agencies and/or internationally.

Cancer: A disease of heritable, somatic mutations affecting cell growth and differentiation, characterized by an abnormal, uncontrolled growth of cells.

Carcinogen: An agent capable of inducing cancer.

Carcinogenesis: The origin or production of a benign or malignant tumor. The carcinogenic event modifies the genome and/or other molecular control mechanisms of the target cells, giving rise to a population of altered cells.

Case-control Study: An epidemiologic study contrasting those with the disease of interest (cases) to those without the disease (controls). The groups are then compared with respect to exposure history, to ascertain whether they differ in the proportion exposed to the chemical(s) under investigation.

Chronic Effect: An effect that occurs as a result of repeated or long term (chronic) exposures.

Chronic Exposure: Repeated exposure by the oral, dermal, or inhalation route for more than approximately 10% of the life span in humans (more than approximately 90 days to 2 years in typically used laboratory animal species).

Chronic Reference Concentration (RfC): An estimate (with uncertainty spanning perhaps an order of magnitude) of a continuous inhalation exposure for a chronic duration (up to a lifetime) to the human population (including sensitive subgroups) that is likely to be without an appreciable risk of deleterious effects during a lifetime. It can be derived from a NOAEL, LOAEL, or benchmark concentration, with uncertainty factors generally applied to reflect limitations of the data used. Generally used in EPA's noncancer health assessments.

Chronic Reference Dose (RfD): An estimate (with uncertainty spanning perhaps an order of magnitude) of a daily oral exposure for a chronic duration (up to a lifetime) to the human population (including sensitive subgroups) that is likely to be without an appreciable risk of deleterious effects during a lifetime. It can be derived from a

NOAEL, LOAEL, or benchmark dose, with uncertainty factors generally applied to reflect limitations of the data used. Generally used in EPA's noncancer health assessments.

Chronic Study: A toxicity study designed to measure the (toxic) effects of chronic exposure to a chemical.

Chronic Toxicity: The capacity of a substance to cause adverse human health effects as a result of chronic exposure.

Co-carcinogen: An agent that, when administered with a carcinogen, enhances the activity of the carcinogen.

Cohort Study (or Prospective Study): An epidemiologic study comparing those with an exposure of interest to those without the exposure. These two cohorts are then followed over time to determine the differences in the rates of disease between the exposure subjects.

Confounder (or Confounding Factor): A condition or variable that is both a risk factor for disease and associated with an exposure of interest. This association between the exposure of interest and the confounder (a true risk factor for disease) may make it falsely appear that the exposure of interest is associated with disease.

Control Group (or Reference Group): A group used as the baseline for comparison in epidemiologic studies or laboratory studies. This group is selected because it either lacks the disease of interest (case-control group) or lacks the exposure of concern (cohort study).

Critical Concentration: An ambient chemical concentration expressed in units of $\mu\text{g}/\text{m}^3$ and used in the operational derivation of the inhalation RfC. This concentration will be the NOAEL Human Equivalent Concentration (HEC) adjusted from principal study data.

Critical Effect: The first adverse effect, or its known precursor, that occurs to the most sensitive species as the dose rate of an agent increases.

Critical Study: The study that contributes most significantly to the qualitative and quantitative assessment of risk. Also called Principal Study.

D

Developmental Toxicity: Adverse effects on the developing organism that may result from exposure prior to conception (either parent), during prenatal development, or postnatally until the time of sexual maturation. The major manifestations of developmental toxicity include death of the developing organism, structural abnormality, altered growth, and functional deficiency.

Dose: The amount of a substance available for interactions with metabolic processes or biologically significant receptors after crossing the outer boundary of an organism. The POTENTIAL DOSE is the amount ingested, inhaled, or applied to the skin. The APPLIED DOSE is the amount presented to an absorption barrier and available for absorption (although not necessarily having yet crossed the outer boundary of the organism). The ABSORBED DOSE is the amount crossing a specific absorption barrier (e.g. the exchange boundaries of the skin, lung, and digestive tract) through uptake processes. INTERNAL DOSE is a more general term denoting the amount absorbed without respect to specific absorption barriers or exchange boundaries. The amount of the chemical available for interaction by any particular organ or cell is termed the DELIVERED or BIOLOGICALLY EFFECTIVE DOSE for that organ or cell.

Dose-Response Assessment: A determination of the relationship between the magnitude of an administered, applied, or internal dose and a specific biological response. Response can be expressed as measured or observed incidence or change in level of response, percent response in groups of subjects (or populations), or the probability of occurrence or change in level of response within a population.

Dose-Response Relationship: The relationship between a quantified exposure (dose) and the proportion of subjects demonstrating specific biologically significant changes in incidence and/or in degree of change (response).

E

Effective Dose (ED₁₀): The dose corresponding to a 10% increase in an adverse effect, relative to the control response.

Endpoint: An observable or measurable biological event or chemical concentration (e.g., metabolite concentration in a target tissue) used as an index of an effect of a chemical exposure.

Epidemiology: The study of the distribution and determinants of health-related states or events in specified populations.

Estimated Exposure Dose (EED): The measured or calculated dose to which humans are likely to be exposed considering all sources and routes of exposure.

Excess Lifetime Risk: The additional or extra risk of developing cancer due to exposure to a toxic substance incurred over the lifetime of an individual.

Exposure: Contact made between a chemical, physical, or biological agent and the outer boundary of an organism. Exposure is quantified as the amount of an agent available at the exchange boundaries of the organism (e.g., skin, lungs, gut).

Exposure Assessment: An identification and evaluation of the human population exposed to a toxic agent, describing its composition and size, as well as the type, magnitude, frequency, route and duration of exposure.

Extra Risk (ER): A calculation of risk of adverse effects which adjusts for background incidence rates of the same effects, by estimating risk at dose d only among the fraction of the population not expected to respond to the secondary (background) causes: $ER = [P(d) - P(0)] / [1 - P(0)]$. For example, if the background rate ($P(0)$) = 0.8 and the response rate at dose d , $P(d)$ = .9, then $ER = (0.9 - 0.8) / (1 - 0.8) = 0.1 / 0.2 = 0.5$. That is, at dose d , an additional 10% of the population is expected to respond adversely. But since only 20% of the population was expected to be free of adverse effects without the exposure of interest, this 10% represents 50% of the population that would otherwise have been unharmed by this exposure.

Extrapolation, low dose: An estimate of the response at a point below the range of the experimental data, generally through the use of a mathematical model.

F

Forced Expiratory Volume (FEV₁): The volume of air that can be forcibly exhaled during the first second of expiration following a maximal inspiration.

Forced Vital Capacity (FVC): The maximal volume of air that can be exhaled as forcibly and rapidly as possible after a maximal inspiration.

Frank Effect Level (FEL): A level of exposure or dose that produces irreversible, adverse effects at a statistically or biologically significant increase in frequency or severity between those exposed and those not exposed.

Functional Residual Capacity (FRC): The lung volume at the end of tidal expiration (TLC - IC).

G

Gamma (Multi-hit) Model: A generalization of the one-hit model (see definition) for low-dose extrapolation. The probability $P(d)$ that an individual will respond to lifetime, continuous exposure to dose d is given by

$$P(d) = \frac{\lambda^k}{\Gamma(k)} \int_0^d t^{k-1} e^{-\lambda t} dt$$

Where: $\Gamma(k)$ = the gamma function,

k = the number of 'hits' estimated by the model, and

λ = fitted coefficient.

Guidelines (human health risk assessment): Official, peer-reviewed documentation stating current U.S. EPA methodology in assessing risk of harm from environmental pollutants to populations.

Examples:

Guidelines for Carcinogenic Risk Assessment: U.S. EPA guidelines intended to guide Agency evaluation of suspect carcinogens. 66 FR 17765-17817, April 7, 2005.

Guidelines for Exposure Assessment: U.S. EPA guidelines intended to guide Agency analysis of potential exposure to chemical substances. 51 FR 22888-22938, May 29, 1992.

Guidelines for Developmental Toxicity Risk Assessment: U.S. EPA guidelines intended to guide Agency analysis of developmental toxicity data. 51 FR 34028-34040, October 1996.

Guidelines for Mutagenicity Risk Assessment: U. S. EPA guidelines intended to guide Agency analysis of mutagenicity data. 51 FR 34006-34016, September, 1986.

H

Hazard: A potential source of harm.

Hazard Assessment: The process of determining whether exposure to an agent can cause an increase in the incidence of a particular adverse health effect (e.g., cancer, birth defect) and whether the adverse health effect is likely to occur in humans.

Hazard Characterization: A description of the potential adverse health effects attributable to a specific environmental agent, the mechanisms by which agents exert their toxic effects, and the associated dose, route, duration, and timing of exposure.

Human Equivalent Concentration (HEC) or Dose (HED): The human concentration (for inhalation exposure) or dose (for other routes of exposure) of an agent that is believed to induce the same magnitude of toxic effect as the experimental animal species concentration or dose. This adjustment may incorporate toxicokinetic

information on the particular agent, if available, or use a default procedure, such as assuming that daily oral doses experienced for a lifetime are proportional to body weight raised to the 0.75 power.

I

Incidence: The number of new cases of a disease that develop within a specified population over a specified period of time.

Incidence Rate: The ratio of new cases within a population to the total population at risk given a specified period of time.

Individual Risk: The probability that an individual will experience an adverse effect.

Inhalation Unit Risk: The upper-bound excess lifetime cancer risk estimated to result from continuous exposure to an agent at a concentration of $1 \mu\text{g}/\text{m}^3$ in air. The interpretation of inhalation unit risk would be as follows: if unit risk = 2×10^{-6} per $\mu\text{g}/\text{m}^3$, 2 excess cancer cases (upper bound estimate) are expected to develop per 1,000,000 people if exposed daily for a lifetime to $1 \mu\text{g}$ of the chemical per m^3 of air.

Initiation: The first stage of carcinogenesis.

Interspecies Dose Conversion: The process of extrapolating from animal doses to human equivalent doses.

L

Latency Period: The time between first exposure to an agent and manifestation or detection of a health effect of interest.

Limited Evidence: A term used in evaluating study data for the classification of a carcinogen by the 1986 U.S. EPA guidelines for carcinogen risk assessment. This classification indicates that a causal interpretation is credible but that alternative explanations such as chance, bias, and confounding variables could not be completely excluded.

Linear Dose Response: A pattern of frequency or severity of biological response that varies directly with the amount of dose of an agent.

Linearized Multistage Procedure: A modification of the multistage model, used for estimating carcinogenic risk, that incorporates a linear upper bound on extra risk for exposures below the experimental range.

Logistic Model: A dose-response model used for low-dose extrapolation, of the form:

$$P(d) = \gamma + \frac{1 - \gamma}{1 + e^{-(\alpha + \beta d)}}$$

Where: $P(d)$ = probability of cancer from lifetime, continuous exposure at dose rate d , and
 α, β = fitted parameters; and
 γ = background incidence rate.

Longer-Term Exposure: Repeated exposure by the oral, dermal, or inhalation route for more than 30 days, up to approximately 10% of the life span in humans (more than 30 days up to approximately 90 days in typically used laboratory animal species).

Lower Limit on Effective Dose₁₀ (LED₁₀): The 95% lower confidence limit of the dose of a chemical needed to produce an adverse effect in 10 percent of those exposed to the chemical, relative to control.

Lowest-Observed-Adverse-Effect Level (LOAEL): The lowest exposure level at which there are biologically significant increases in frequency or severity of adverse effects between the exposed population and its appropriate control group.

Lowest-Observed-Effect Level (LOEL or LEL): In a study, the lowest dose or exposure level at which a statistically or biologically significant effect is observed in the exposed population compared with an appropriate unexposed control group.

M

Malignant Tumor: An abnormal growth of tissue which can invade adjacent or distant tissues.

Margin of Exposure (MOE): The LED_{10} or other point of departure divided by the actual or projected environmental exposure of interest.

Mass Median Aerodynamic Diameter (MMAD): Median of the distribution of airborne particle mass with respect to the aerodynamic diameter. MMADs are usually accompanied by the geometric standard deviation (g or sigma g) which characterizes the variability of the particle size distribution.

Maximum Likelihood (ML) Method, Maximum Likelihood Estimate (MLE): Statistical method for estimating a population parameter most likely to have produced the sample observations.

Metastasis: The dissemination or secondary growth of a malignant tumor at a site distant from the primary tumor.

Model: A mathematical function with parameters that can be adjusted so the function closely describes a set of empirical data. A mechanistic model usually reflects observed or hypothesized biological or physical mechanisms, and has model parameters with real world interpretation. In contrast, statistical or empirical models selected for particular numerical properties are fitted to data; model parameters may or may not have real world interpretation. When data quality is otherwise equivalent, extrapolation from mechanistic models (e.g., biologically based dose-response models) often carries higher confidence than extrapolation using empirical models (e.g., logistic model).

Modifying Factor (MF): A factor used in the derivation of a reference dose or reference concentration. The magnitude of the MF reflects the scientific uncertainties of the study and database not explicitly treated with standard uncertainty factors (e.g., the completeness of the overall database). A MF is greater than zero and less than or equal to 10, and the default value for the MF is 1. [Use of a modifying factor was discontinued in 2004.]

Monte Carlo Technique: A repeated random sampling from the distribution of values for each of the parameters in a calculation (e.g., lifetime average daily exposure), to derive a distribution of estimates (of exposures) in the population.

Multistage Model: A mathematical function used to extrapolate the probability of cancer from animal bioassay data, using the form:

$$P(d) = 1 - e^{-(q_0 + q_1 d + q_2 d^2 + \dots + q_k d^k)}$$

Where: $P(d)$ = probability of cancer from a continuous, lifetime exposure rate d ;

q_i = fitted dose coefficients of model; $i=0, 1, \dots, k$; and

k = number of stages selected through best fit of the model, no greater than one less than the number of available dose groups.

Multistage Weibull Model: A dose-response model for low-dose extrapolation that includes a term for decreased survival time associated with tumor incidence:

$$P(d, t) = 1 - e^{-(q_0 + q_1 d + q_2 d^2 + \dots + q_k d^k)(t - t_0)^z}$$

Where: $P(d, t)$ = the probability of a tumor (or other response) from lifetime, continuous exposure at dose d until age t (when tumor is fatal);

q_i = fitted dose parameters, $i=0, 1, \dots, k$;

k = no greater than the number of dose groups - 1;

t_0 = the time between when a potentially fatal tumor becomes observable and when it causes death; and

z = fitted time parameter (also called "Weibull" parameter).

Mutagen: A substance that can induce an alteration in the structure of DNA.

N

Neoplasm: An abnormal growth of tissue that may be benign or malignant.

No-Observed-Adverse-Effect Level (NOAEL): The highest exposure level at which there are no biologically significant increases in the frequency or severity of adverse effect between the exposed population and its appropriate control; some effects may be produced at this level, but they are not considered adverse or precursors of adverse effects.

No-Observed-Effect Level (NOEL): An exposure level at which there are no statistically or biologically significant increases in the frequency or severity of any effect between the exposed population and its appropriate control.

Non-Linear Dose Response: A pattern of frequency or severity of biological response that does not vary directly with the amount of dose of an agent.

O

Odds Ratio (OR): A relative measure of the difference in exposure between the diseased (cases) and not diseased (controls) individuals in a case-control study. The OR is interpreted similarly to the relative risk.

Oncogenic: Resulting from a gene that can induce neoplastic transformations in the cell in which it occurs or into which it is introduced.

One Hit Model: A dose-response model based on a mechanistic argument that there is a response after a target site has been hit by a single biologically effective unit of dose within a given time period. The form of the model, a special case of the gamma, multistage, and Weibull models, is given by:

$$P(d) = 1 - e^{(-\lambda d)}$$

Where $P(d)$ = probability of cancer from lifetime continuous exposure at dose rate d , and

λ = fitted dose coefficient.

Oral Slope Factor: An upper bound, approximating a 95% confidence limit, on the increased cancer risk from a lifetime oral exposure to an agent. This estimate, usually expressed in units of proportion (of a population) affected per mg/kg-day, is generally reserved for use in the low-dose region of the dose-response relationship, that is, for exposures corresponding to risks less than 1 in 100.

Organoleptic: Affecting or involving a sense organ such as that of taste, smell, or sight.

P

Physiologically Based Pharmacokinetic (PBPK) Model: A model that estimates the dose to a target tissue or organ by taking into account the rate of absorption into the body, distribution among target organs and tissues, metabolism, and excretion.

Point of Departure: The dose-response point that marks the beginning of a low-dose extrapolation. This point can be the lower bound on dose for an estimated incidence or a change in response level from a dose-response model (BMD), or a NOAEL or LOAEL for an observed incidence, or change in level of response.

ppb: A unit of measure expressed as parts per billion. Equivalent to 1×10^{-9} .

ppm: A unit of measure expressed as parts per million. Equivalent to 1×10^{-6} .

Prevalence: The proportion of disease cases that exist within a population at a specific point in time, relative to the number of individuals within that population at the same point in time.

Probit Model: A dose-response model of the form:

$$P(d) = \gamma + (1 - \gamma) \frac{1}{\sqrt{2\pi}} \int_{-\infty}^{\alpha + \beta d} e^{-\frac{u^2}{2}} du$$

Where: $P(d)$ = the probability that an individual selected at random will respond at dose d , assuming a normal distribution of tolerances;

α, β = fitted parameters; and

γ = background response rate.

Promoter: An agent that is not carcinogenic itself, but when administered after an initiator of carcinogenesis, stimulates the clonal expansion of the initiated cell to produce a neoplasm.

Proportionate Mortality Ratio (PMR): The proportion of deaths due to the disease of interest in the exposed population divided by the proportion of deaths due to the disease of interest in the unexposed or reference population. It is frequently converted to a percent by multiplying the ratio by 100.

Prospective Study: See cohort study.

R

Reference Concentration (RfC): An estimate (with uncertainty spanning perhaps an order of magnitude) of a continuous inhalation exposure to the human population (including sensitive subgroups) that is likely to be without an appreciable risk of deleterious effects during a lifetime. It can be derived from a NOAEL, LOAEL, or benchmark concentration, with uncertainty factors generally applied to reflect limitations of the data used. Generally used in EPA's noncancer health assessments. [Durations include acute, short-term, subchronic, and chronic and are defined individually in this glossary].

Reference Dose (RfD): An estimate (with uncertainty spanning perhaps an order of magnitude) of a daily oral exposure to the human population (including sensitive subgroups) that is likely to be without an appreciable risk of deleterious effects during a lifetime. It can be derived from a NOAEL, LOAEL, or benchmark dose, with uncertainty factors generally applied to reflect limitations of the data used. Generally used in EPA's noncancer health assessments. [Durations include acute, short-term, subchronic, and chronic and are defined individually in this glossary].

Reference Value (RfV): An estimate of an exposure for a given duration to the human population (including susceptible subgroups) that is likely to be without an appreciable risk of adverse health effects over a lifetime. It is derived from a BMDL, a NOAEL, a LOAEL, or another suitable point of departure, with uncertainty/variability factors applied to reflect limitations of the data used. [Durations include acute, short-term, subchronic, and chronic and are defined individually in this glossary.] [Reference value is a term proposed in the report, "A Review of the Reference Dose and Reference Concentration Processes" (EPA, 2002), and is a generic term not specific to a given route of exposure. EPA develops numerical toxicity values for the RfD and RfC only; no numerical toxicity values are developed for the RfV.]

Regional Deposited Dose (RDD): The deposited dose of particles calculated for a respiratory tract region of interest (r) as related to an observed toxicity. For respiratory effects of particles, the deposited dose is adjusted for ventilatory volumes and the surface area of the respiratory region effected (mg/min-sq. cm). For extra respiratory effects of particles, the deposited dose in the total respiratory system is adjusted for ventilatory volumes and body weight (mg/min-kg).

Regional Deposited Dose Ratio (RDDR): The ratio of the regional deposited dose calculated for a given exposure in the animal species of interest to the regional deposited dose of the same exposure in a human. This ratio is used to adjust the exposure effect level for interspecies dosimetric differences to derive a human equivalent concentration for particles.

Regional Gas Dose: The gas dose calculated for the region of interest as related to the observed effect for respiratory effects. The deposited dose is adjusted for ventilatory volumes and the surface area of the respiratory region effected (mg/min-sq.cm).

Regional Gas Dose Ratio (RGDR): The ratio of the regional gas dose calculated for a given exposure in the animal species of interest to the regional gas dose of the same exposure in humans. This ratio is used to adjust the exposure effect level for interspecies dosimetric differences to derive a human equivalent concentration for gases with respiratory effects.

Relative Risk (or Risk Ratio (RR)): The relative measure of the difference in risk between the exposed and unexposed populations in a cohort study. The relative risk is defined as the rate of disease among the exposed divided by the rate of the disease among the unexposed. A relative risk of 2 means that the exposed group has twice the disease risk as the unexposed group.

Reserve Volume: The volume of air remaining in the lungs after a maximal expiration.

Residual Volume (RV): The lung volume after maximal expiration (TLC - VC).

Risk (in the context of human health): The probability of adverse effects resulting from exposure to an environmental agent or mixture of agents.

Risk Assessment (in the context of human health): The evaluation of scientific information on the hazardous properties of environmental agents (hazard characterization), the dose-response relationship (dose-response assessment), and the extent of human exposure to those agents (exposure assessment). The product of the risk assessment is a statement regarding the probability that populations or individuals so exposed will be harmed and to what degree (risk characterization).

Risk Characterization: The integration of information on hazard, exposure, and dose-response to provide an estimate of the likelihood that any of the identified adverse effects will occur in exposed people.

Risk Management (in the context of human health): A decision making process that accounts for political, social, economic and engineering implications together with risk-related information in order to develop, analyze and compare management options and select the appropriate managerial response to a potential chronic health hazard.

S

Short-Term Exposure: Repeated exposure by the oral, dermal, or inhalation route for more than 24 hours, up to 30 days.

Short-term Reference Concentration (RfC): An estimate (with uncertainty spanning perhaps an order of magnitude) of a continuous inhalation exposure for short-term duration (up to 30 days) to the human population (including sensitive subgroups) that is likely to be without an appreciable risk of deleterious effects during a lifetime. It can be derived from a NOAEL, LOAEL, or benchmark concentration, with uncertainty factors generally applied to reflect limitations of the data used. Generally used in EPA's noncancer health assessments.

Short-term Reference Dose (RfD): An estimate (with uncertainty spanning perhaps an order of magnitude) of a daily oral exposure for a short-term duration (up to 30 days) to the human population (including sensitive subgroups) that is likely to be without an appreciable risk of deleterious effects during a lifetime. It can be derived from a NOAEL, LOAEL, or benchmark dose, with uncertainty factors generally applied to reflect limitations of the data used. Generally used in EPA's noncancer health assessments.

Sigma g (s g): Geometric standard deviation. (See Mass Median Aerodynamic Diameter.)

Slope Factor: An upper bound, approximating a 95% confidence limit, on the increased cancer risk from a lifetime exposure to an agent. This estimate, usually expressed in units of proportion (of a population) affected per mg/kg-day, is generally reserved for use in the low-dose region of the dose-response relationship, that is, for exposures corresponding to risks less than 1 in 100.

Standardized Mortality Ratio (SMR): This is the relative measure of the difference in risk between the exposed and unexposed populations in a cohort study. The SMR is similar to the relative risk in both definition and interpretation. This measure is usually standardized to control for any differences in age, sex, and/or race between the exposed and reference populations. It is frequently converted to a percent by multiplying the ratio by 100.

Statistical Significance: The probability that a result is not likely to be due to chance alone. By convention, a difference between two groups is usually considered statistically significant if chance could explain it only 5% of the time or less. Study design considerations may influence the a priori choice of a different level of statistical significance.

Subchronic Exposure: Repeated exposure by the oral, dermal, or inhalation route for more than 30 days, up to approximately 10% of the life span in humans (more than 30 days up to approximately 90 days in typically used laboratory animal species). [See also longer-term exposure.]

Subchronic Reference Concentration (RfC): An estimate (with uncertainty spanning perhaps an order of magnitude) of a continuous inhalation exposure for a subchronic duration (up to 10% of average lifespan) to the human population (including sensitive subgroups) that is likely to be without an appreciable risk of deleterious effects during a lifetime. It can be derived from a NOAEL, LOAEL, or benchmark concentration, with uncertainty factors generally applied to reflect limitations of the data used. Generally used in EPA's noncancer health assessments.

Subchronic Reference Dose (RfD): An estimate (with uncertainty spanning perhaps an order of magnitude) of a daily oral exposure for a subchronic duration (up to 10% of average lifespan) to the human population (including sensitive subgroups) that is likely to be without an appreciable risk of deleterious effects during a lifetime. It can be derived from a NOAEL, LOAEL, or benchmark dose, with uncertainty factors generally applied to reflect limitations of the data used. Generally used in EPA's noncancer health assessments.

Subchronic Study: A toxicity study designed to measure effects from subchronic exposure to a chemical.

Sufficient Evidence: A term used in evaluating study data for the classification of a carcinogen under the 1986 U.S. EPA guidelines for carcinogen risk assessment. This classification indicates that there is a causal relationship between the agent or agents and human cancer.

Superfund: Federal authority, established by the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) in 1980, to respond directly to releases or threatened releases of hazardous substances that may endanger health or welfare.

Supporting Studies: Studies that contain information useful for providing insight and support for conclusions.

Susceptibility: Increased likelihood of an adverse effect, often discussed in terms of relationship to a factor that can be used to describe a human subpopulation (e.g., life stage, demographic feature, or genetic characteristic).

Susceptible Subgroups: May refer to life stages, for example, children or the elderly, or to other segments of the population, for example, asthmatics or the immune-compromised, but are likely to be somewhat chemical-specific and may not be consistently defined in all cases.

Systemic Effects or Systemic Toxicity: Toxic effects as a result of absorption and distribution of a toxicant to a site distant from its entry point.

T

Target Organ: The biological organ(s) most adversely affected by exposure to a chemical, physical, or biological agent.

Teratogenic: Structural developmental defects due to exposure to a chemical agent during formation of individual organs.

Threshold: The dose or exposure below which no deleterious effect is expected to occur.

Tidal Volume (V_T): The volume of air inhaled/exhaled during normal breathing.

Total Lung Volume (TLV): The lung volume at maximal inspiration.

Toxicity: Deleterious or adverse biological effects elicited by a chemical, physical, or biological agent.

Toxicodynamics: The determination and quantification of the sequence of events at the cellular and molecular levels leading to a toxic response to an environmental agent (sometimes referred to as pharmacodynamics).

Toxicokinetics: The determination and quantification of the time course of absorption, distribution, biotransformation, and excretion of chemicals (sometimes referred to as pharmacokinetics).

Toxicology: The study of harmful interactions between chemical, physical, or biological agents and biological systems.

Toxic Substance: A chemical, physical, or biological agent that may cause an adverse effect or effects to biological systems.

Tumor: An abnormal, uncontrolled growth of cells. Synonym: neoplasm

Tumor Progression: Under the Armitage-Doll multistage theory of cancer development, the transition of a cell line between the stages which lead to cancer.

Threshold Limit Value (TLV): Recommended guidelines for occupational exposure to airborne contaminants published by the American Conference of Governmental Industrial Hygienists (ACGIH). TLVs represent the average concentration in mg/m³ for an 8-hour workday and a 40-hour work week to which nearly all workers may be repeatedly exposed, day after day, without adverse effect.

U

Uncertainty: Uncertainty occurs because of a lack of knowledge. It is not the same as variability. For example, a risk assessor may be very certain that different people drink different amounts of water but may be uncertain about how much variability there is in water intakes within the population. Uncertainty can often be reduced by collecting more and better data, whereas variability is an inherent property of the population being evaluated. Variability can be better characterized with more data but it cannot be reduced or eliminated. Efforts to clearly distinguish between variability and uncertainty are important for both risk assessment and risk characterization.

Uncertainty/Variability Factor (UFs): One of several, generally 10-fold, default factors used in operationally deriving the RfD and RfC from experimental data. The factors are intended to account for (1) variation in susceptibility among the members of the human population (i.e., inter-individual or intraspecies variability); (2) uncertainty in extrapolating animal data to humans (i.e., interspecies uncertainty); (3) uncertainty in extrapolating from data obtained in a study with less-than-lifetime exposure (i.e., extrapolating from subchronic to chronic exposure); (4) uncertainty in extrapolating from a LOAEL rather than from a NOAEL; and (5) uncertainty associated with extrapolation when the database is incomplete.

Unit Risk: The upper-bound excess lifetime cancer risk estimated to result from continuous exposure to an agent at a concentration of 1 µg/L in water, or 1 µg/m³ in air. The interpretation of unit risk would be as follows: if unit risk = 2×10^{-6} per µg/L, 2 excess cancer cases (upper bound estimate) are expected to develop per 1,000,000 people if exposed daily for a lifetime to 1 µg of the chemical per liter of drinking water.

Upper bound: A plausible upper limit to the true value of a quantity. This is usually not a true statistical confidence limit.

V

Variability: Variability refers to true heterogeneity or diversity. For example, among a population that drinks water from the same source and with the same contaminant concentration, the risks from consuming the water may vary. This may be due to differences in exposure (i.e., different people drinking different amounts of water and having different body weights, different exposure frequencies, and different exposure durations) as well as differences in response (e.g., genetic differences in resistance to a chemical dose). Those inherent differences are referred to as variability. Differences among individuals in a population are referred to as inter-individual variability, differences for one individual over time is referred to as intra-individual variability.

Vital Capacity (VC): The maximum volume that can be exhaled in a single breath (TLC-RC).

W

Weibull Model: A dose-response model of the form:

$$P(d) = \gamma + (1 - \gamma)(1 - e^{-\beta d^\alpha})$$

Where: $P(d)$ = the probability of a tumor (or other response) from lifetime, continuous exposure at dose d until age t (when tumor is fatal);

α = fitted dose parameter (sometimes called "Weibull" parameter);

β = fitted dose parameter;

γ = background response rate.

Weight-of-Evidence (WOE) for Carcinogenicity: A system used by the U.S. EPA for characterizing the extent to which the available data support the hypothesis that an agent causes cancer in humans. Under EPA's 1986 risk assessment guidelines, the WOE was described by categories "A through E", Group A for known human carcinogens through Group E for agents with evidence of noncarcinogenicity. The approach outlined in EPA's guidelines for carcinogen risk assessment (2005) considers all scientific information in determining whether and under what conditions an agent may cause cancer in humans, and provides a narrative approach to characterize carcinogenicity rather than categories. Five standard weight-of-evidence descriptors are used as part of the narrative.

This list of acronyms and abbreviations is provided as a reference to terminology that is used on the IRIS website. It is intended to assist users in referencing terms utilized by the U.S. EPA through out the website and related materials. It is assumed that the user has some familiarity with risk assessment and health science.

A B C D E F G H I J K L M N O P Q R S T U V W X Y Z

A

- AADI - Adjusted Acceptable Daily Intake
- AChE - acetylcholinesterase
- ACGIH - American Conference of Governmental Industrial Hygienists

- ADI - Acceptable Daily Intake
- AHFS - American Hospital Formulary Service
- a.i. - active ingredient
- AIHA - American Industrial Health Association
- AMA - American Medical Association
- APA - American Pharmaceutical Association
- ASCII - American Standard Code for Information Exchange
- AUR - Air Unit Risk

B

- $b:a \lambda(a)$ - Blood-to-air partition coefficient of the chemical for the experimental animal species used in the HEC derivation of an RfC
- $b:a \lambda(h)$ - Blood-to-air partition coefficient of the chemical for the human used in the HEC derivation of an RfC
- BHP - biodegradation, hydrolysis, and photolysis
- BOD5 - biochemical oxygen demand as measured in the standard 5-day test
- BUN - blood urea nitrogen
- Bw - body weight
- BWa - Body weight (kg) for experimental animal species used in the HEC derivation of an RfC.
- BWh - Body weight (kg) for human used in the HEC derivation of an RfC.

C

- CAG - Carcinogen Assessment Group, U.S. EPA
- CAS - Chemical Abstracts Service
- CBI - Confidential business information
- cc - cubic centimeters
- CC - closed cup
- CDC - Centers for Disease Control

- CERCLA - Comprehensive Environmental Response, Compensation, and Liability Act of 1980
- CFR - Code of Federal Regulations
- CF - Conversion factor based on PBPK modeling used in the HEC derivation of an RfC for gases. Note: The CF is specific for the experimental animal species and the exposure regimen and concentration simulated.
- ChE - cholinesterase
- CHO - Chinese hamster ovary
- CIIT - Chemical Industry Institute of Toxicology
- CNS - central nervous system
- CPK - creatine phosphokinase
- CRAVE - Carcinogen Risk Assessment Verification Endeavor
- cu.m - cubic meter
- CWA - Clean Water Act

D

- DASE - Dutch Association of Safety Experts
- DHEW - U.S. Department of Health, Education, and Welfare (now U.S. Department of Health and Human Services)
- DNA - deoxyribonucleic acid
- DOT - U.S. Department of Transportation
- DW - drinking water
- DWEL - Drinking Water Equivalent Level

E

- E - exponent (e.g., 1.5E-6 = 1.5 x 10 to the power of -6)
- EED - estimated exposure dose
- EEG - electroencephalogram
- EKG - electrocardiogram

- ELISA - enzyme-linked immunosorbent assay
- EMTD - estimated maximum tolerated dose
- EP - Extraction Procedure
- ER - Extrarespiratory. Refers to effects peripheral to the respiratory system as the portal-of-entry, or systemic effects.
- ET - Extrathoracic region of the respiratory tract
- EPA - U.S. Environmental Protection Agency

F

- FEL - frank-effect level
- FIFRA - Federal Insecticide, Fungicide, and Rodenticide Act
- FOI - Freedom of Information
- F1 - first filial generation (in experimental animals)
- FR - Federal Register
- FRC - functional reserve capacity
- FTS - Federal Telecommunications System
- FWS - U.S. Fish and Wildlife Service

G

- g - grams
- GI - gastrointestinal
- GPT - glutamic-pyruvic transaminase

H

- HA - Health Advisory
- HAPPS - Hazardous Air Pollution Prioritization System
- HAS - Health Assessment Summary

- HCT - hematocrit
- HDT - highest dose tested
- HEC - human equivalent concentration
- HEEP - Health and Environmental Effects Profile
- Hgb - hemoglobin
- HHS - U.S. Department of Health and Human Services
- HSDB - Hazardous Substance Database

I

- IARC - International Agency for Research on Cancer
- ICR - Institute of Cancer Research
- ICRP - International Commission for Radiological Protection
- i.m. - intramuscular
- i.p. - intraperitoneal
- i.v. - intravenous
- IRIS - Integrated Risk Information System
- ITII - International Technical Information Institute

K

- kg - kilogram

L

- L - liter
- LCLO - Lethal Concentration Low; the lowest concentration at which death occurred
- LC50 - Lethal Concentration 50; concentration lethal to 50% of the animals LDLO
- LD50 - Lethal Dose 50; dose lethal to 50% of the animals

- LDH - lactic-acid dehydrogenase
- LDT - lowest dose tested
- LEL - lower explosive limit
- LEL - lowest-effect level
- Lethal Dose Low - the lowest dose at which death occurred
- LOAEL - lowest-observed-adverse-effect level
- LOAEL(ADJ) - LOAEL adjusted to continuous exposure duration from an intermittent regimen by hour/day and days/7 days.
- LOAEL(HEC) - LOAEL adjusted for dosimetric differences across species to a human equivalent concentration.

M

- m - meter
- MCL - maximum contaminant level
- MCLG - maximum contaminant level goal
- MED - minimum effective dose
- MEFV - maximum expiratory flow volume
- MF - modifying factor
- mg - milligram
- mg/kg - milligrams per kilogram
- mg/L - milligrams per liter
- mmHg - millimeters of mercury; a measure of pressure
- MMAD - mass median aerodynamic diameter
- MOE - margin of exposure
- MOS - margin of safety
- MTD - maximum tolerated dose
- MTL - median threshold limit
- MVa - Minute ventilatory volume for experimental animal species (composite value expressed in cu.m/day) used in the HEC derivation of an RfC.
- MVh - Minute ventilatory volume for human (composite value expressed in cu.m/day) used in the HEC derivation of an RfC.

- MV_h - Minute ventilatory volume for human in an occupational environment, assuming 8 hour/day exposure (composite value expressed in cu.m/day), used in the HEC derivation of an RfC.

N

- NAAQS - National Ambient Air Quality Standards
- NAS - National Academy of Sciences
- NESHAP - National Emission Standards for Hazardous Air Pollutants
- NFPA - National Fire Prevention Association
- ng - nanogram
- NIH - National Institutes of Health
- NIOSH - National Institute for Occupational Safety and Health
- NLM - National Library of Medicine
- NOAEL - no-observed-adverse-effect level
- NOAEL(ADJ) - NOAEL adjusted to continuous exposure duration from an intermittent regimen by hour/day and days/7 days.
- NOAEL(HEC) - NOAEL adjusted for dosimetric differences across species to a human equivalent concentration.
- NOEL - no-observed-effect level
- n.a. - not available
- n.o.s. - not otherwise specified
- NRC - National Research Council
- NSPS - New Source Performance Standards
- NTIS - National Technical Information Service
- NTP - National Toxicology Program

O

- OAQPS - Office of Air Quality Planning and Standards, U.S. EPA
- OAR - Office of Air and Radiation, U.S. EPA

- OARM - Office of Administration and Resources Management, U.S. EPA
- OC - open cup
- OW - Office of Water, U.S. EPA
- OHEA - Office of Health and Environmental Assessment, U.S. EPA
- OHM/TADS - Oil and Hazardous Materials Technical Assistance Data Systems
- OPP - Office of Pesticide Programs, U.S. EPA
- OPPE - Office of Policy Planning and Evaluation, U.S. EPA
- OPTS - Office of Pesticides and Toxic Substances, U.S. EPA
- ORD - Office of Research and Development, U.S. EPA
- OSHA - U.S. Occupational Safety and Health Administration
- OST - Office of Science and Technology, U.S. EPA
- OSWER - Office of Solid Waste and Emergency Response, U.S. EPA
- OTS - Office of Toxic Substances, U.S. EPA
- OWRS - Office of Water Regulations and Standards, U.S. EPA

P

- P - probit dose extrapolation model
- PBPK - physiologically based pharmacokinetic
- pCi - picocurie
- PD - Position Document
- PEL - permissible exposure limit
- PHS - U.S. Public Health Service
- p.o. - per os (by mouth)
- ppb - parts per billion
- ppm - parts per million
- PU - pulmonary region of the respiratory tract

R

- RA - risk assessment

- RBC - red blood cell(s)
- RCRA - Resource Conservation and Recovery Act
- RDDR - Regional deposited dose ratio used in derivation of an HEC for particles.
- RDDR(ER) - Regional deposited dose ratio used in the HEC derivation of an RfC for an observed extrarespiratory effect of particles.
- RDDR(ET) - Regional deposited dose ratio used in the HEC derivation of an RfC for an observed effect of particles in the extrathoracic region of the respiratory tract.
- RDDR(PU) - Regional deposited dose ratio used in the HEC derivation of an RfC for an observed effect of particles in the pulmonary region of the respiratory tract.
- RDDR(TB) - Regional deposited dose ratio used in the HEC derivation of an RfC for an observed effect of particles in the tracheobronchial region of the respiratory tract.
- RDDR(TH) - Regional deposited dose ratio used in the HEC derivation of an RfC for an observed effect of particles in the thoracic region of the respiratory tract.
- RDDR(TOTAL) - Regional deposited dose ratio used the HEC derivation of an RfC for an observed effect of particles in the total respiratory tract.
- RGDR - Regional gas dose ratio used in derivation of an HEC for gases.
- RGDR(ET) - Regional gas dose ratio used in the HEC derivation of an RfC for an observed effect of a gas in the extrathoracic region of the respiratory tract.
- RGDR(PU) - Regional gas dose ratio used in the HEC derivation of an RfC for an observed effect of a gas in the pulmonary region of the respiratory tract.
- RGDR(TB) - Regional gas dose ratio used in the HEC derivation of an RfC for an observed effect of a gas in the tracheobronchial region of the respiratory tract.
- RGDR(TH) - Regional gas dose ratio used in the HEC derivation of an RfC for an observed effect of a gas in the thoracic region of the respiratory tract.
- RGDR(TOTAL) - Regional gas dose ratio used in the HEC derivation of an RfC for an observed effect of a gas in the total respiratory tract.
- RfD - Oral Reference Dose
- RfC - Inhalation Reference Concentration
- RgD - Regulatory Dose
- RM - risk management
- RPAR - rebuttable presumption against registration
- RQ - Reportable Quantity

- RTECS - Registry of Toxic Effects of Chemical Substances
- RV - residual volume

S

- Sa - Surface area (in sq.cm) for respiratory tract region for experimental animal species used in the HEC derivation of an RfC.
- Sa(ET) - Surface area (in sq.cm) of extrathoracic region for experimental animal species used in the HEC derivation of an RfC.
- Sa(TB) - Surface area (in sq.cm) of tracheobronchial region for experimental animal species used in the HEC derivation of an RfC.
- Sa(TH) - Surface area (in sq.cm) of thoracic region for experimental animal species used in the HEC derivation of an RfC.
- Sa(PU) - Surface area (in sq.cm) of pulmonary region for experimental animal species used in the HEC derivation of an RfC.
- Sa(TOTAL) - Surface area (in sq.cm) of total respiratory system for experimental animal species used in the HEC derivation of an RfC.
- SAB - Science Advisory Board
- SANSS - Structure and Nomenclature Search System
- SAP - serum alkaline phosphatase
- SARA - Superfund Amendments and Reauthorization Act of 1986 s.c. subcutaneous
- SCE - sister-chromatid exchange
- SDWA - Safe Drinking Water Act
- SF - safety factor
- SGOT - serum glutamic-oxaloacetic transaminase
- SGPT - serum glutamic-pyruvic transaminase
- Sh - Surface area (in sq.cm) of respiratory tract for human used in the HEC derivation of an RfC.
- Sh(ET) - Surface area (in sq.cm) of extrathoracic region for human used in the HEC derivation of an RfC.
- Sh(TB) - Surface area (in sq.cm) of tracheobronchial region for human used in the HEC derivation of an RfC.

- Sh(TH) - Surface area (in sq.cm) of thoracic region for human used in the HEC derivation of an RfC.
- Sh(PU) - Surface area (in sq.cm) of pulmonary region for human used in the HEC derivation of an RfC.
- Sh(TOTAL) - Surface area (in sq.cm) of total respiratory system for human used in the HEC derivation of an RfC.
- sigma g - geometric standard deviation
- SMCL - secondary maximum contaminant level
- SMR - standard mortality ratio
- sq.cm. - square centimeters
- SRI - Stanford Research Institute
- STEL - short-term exposure limit

T

- TB - tracheobronchial region of the respiratory tract
- TCC - Tagliabue closed cup, a standard method of determining flash points
- TDB - Toxicology Database
- TH - thoracic (TB + PU) region of the respiratory tract
- TLV - Threshold Limit Value
- TOC - Tagliabue open cup, a standard method of determining flash points
- TOTAL - total respiratory tract
- TSCA - Toxic Substances Control Act
- TWA - time-weighted average

U

- UCL - upper confidence limit
- UEL - upper explosive limit
- UF - uncertainty factor
- µg - microgram

- umol - micromoles

V

- VAa - Alveolar ventilation rate (cu.m/day) for experimental animal species used in HEC derivation of an RfC.
- VAh - Alveolar ventilation rate (cu.m/day) for human used in HEC derivation of an RfC.
- VOC - volatile organic compound
- v/v - volume for volume

W

- WBC - white blood cell(s)
- WQC - Water Quality Criteria

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